Manufacturing and Design Journal

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Name: _____

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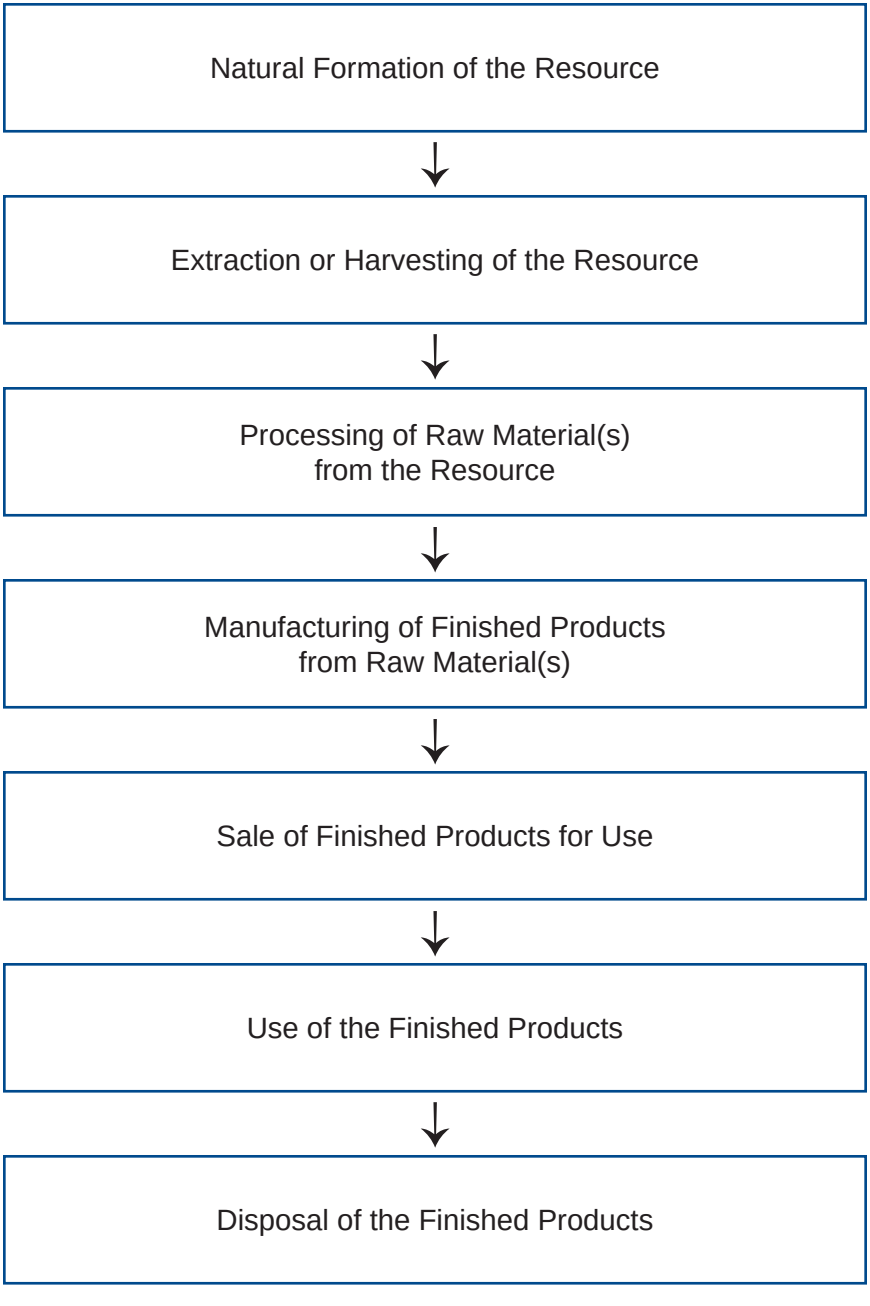
Natural Resource Use Flowchart



Key Vocabulary

Extraction: The removal of a natural resource from its natural origin.

Harvesting: The cutting and collection of natural resources such as crops or timber.

Manufacturing: The processing of goods or creation of products on a large scale.

Natural resources: Materials, such as forests, water, and energy reserves, supplied by nature and used by humans.

Processing: Refining natural resources into raw materials, so that they can be consumed or used in manufacturing.

Raw materials: Natural resources that have not yet been processed or used to manufacture a product.

Origins Chart

Raw material yielded	Natural resource category	Common uses in manufactured products	Method of extraction or harvesting
Bauxite	Mineral ore	Aluminum objects	Surface mining
Clay	Mineral ore	Dinnerware, pottery, tiles for floors and walls, buildings	Surface mining
Copper	Mineral ore	Electrical wires, batteries, cookware, plumbing pipes, coins	Surface mining
Cotton	Plant	Thread, fabric, batting, oil (cottonseed), cottonseed meal (used in livestock feed)	Collecting the seed pod from the plant
Gelatin	Animal	Glue	Rendering animal bones
Graphite	Mineral ore	Pencil lead (which contains graphite, not lead), batteries, lubricants and paint	Surface mining
Iron	Mineral ore	Frames for buildings, bridges, and other structures, tools, cookware, steel, batteries and magnets	Surface mining
Leather	Animal	Clothing, bags, fasteners	Skinning the hide from dead livestock

Origins Chart

Raw material yielded	Natural resource category	Common uses in manufactured products	Method of extraction or harvesting
Limestone	Mineral ore	Fiberglass, building, roads, landscaping, and cement	Surface mining
Petroleum	Fossil fuel	Plastics, paints, synthetic fabrics (PVC), synthetic rubber, foams, thread,	Deep drilling
Resin (rosin)	Plant	Shellacs, cements, musical instrument strings	Collecting the sap from living trees
Rubber (natural)	Plant	Tires, gaskets, insulation, elastic fabrics and fasteners, foams, hoses	Collecting the sap from living trees
Silica/ Quartz	Mineral ore	Glass (and fiberglass), silicon for computer chips, jewelry, lenses, concrete, electronics, abrasives	Surface mining
Soda ash	Mineral ore	Glass (and fiberglass), and food sweetener	Underground mining
Tin	Mineral ore	Cans, containers, soldering material	Surface mining
Wood/ timber	Plants	Houses, floors, furniture, tools, paper	Cutting the stalk off the root (logging)

Assignment

Congratulations! You are the new owner of a toy company that makes toys for young children. The first decision you will need to make in your new job is what new toy you want to add to your toy line. Your company can make one of the following kinds of toys:

- **Stuffed animal** or **action figure**
- **Sports equipment** (balls, rackets, clubs, bats, etc.)

Over the next few lessons, you will design a plan to produce your toy. Your plan will include all stages of manufacturing. These stages will include extracting or harvesting the natural resources and raw materials you need, getting the resources to the factory, and putting the toy together.

Follow these steps to get started:

1. Decide on the type of toy your company will make. Write the name and type of toy here:

   _____

Assignment

2. List the parts of your toy in the first column, below. Make sure you include at least three parts. Using the Origins Chart on pages 4–5 as a guide, identify the raw materials and natural resources you might use to make each part of your toy. Think of at least two different materials for each part of your toy. You will be able to change your choices later.

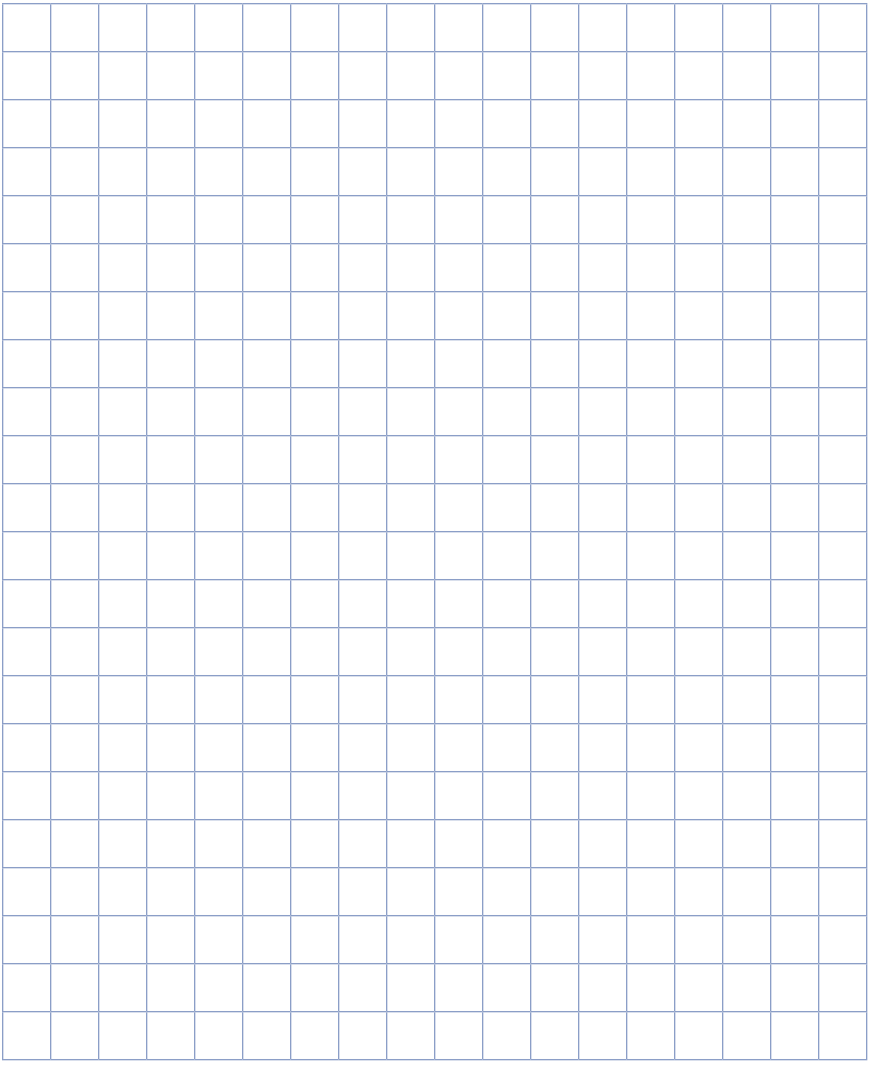
Parts of toy	Natural resources/raw materials needed for parts

Toy Design Blueprint

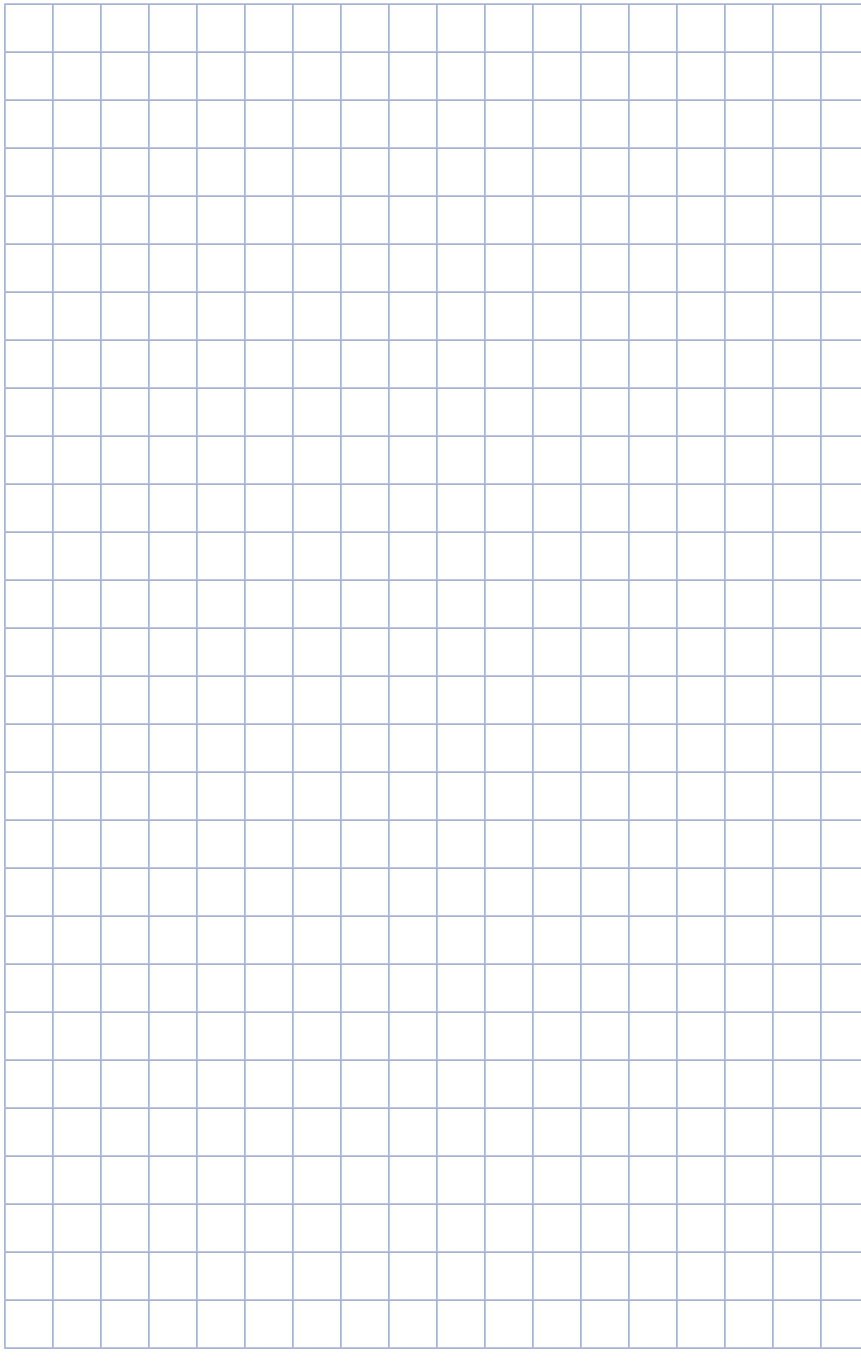
Today's Task

Create a blueprint for the toy you want to manufacture. Label the parts of your toy that and make a list of the material(s) you would like to use for each part. Draw two views of your toy.

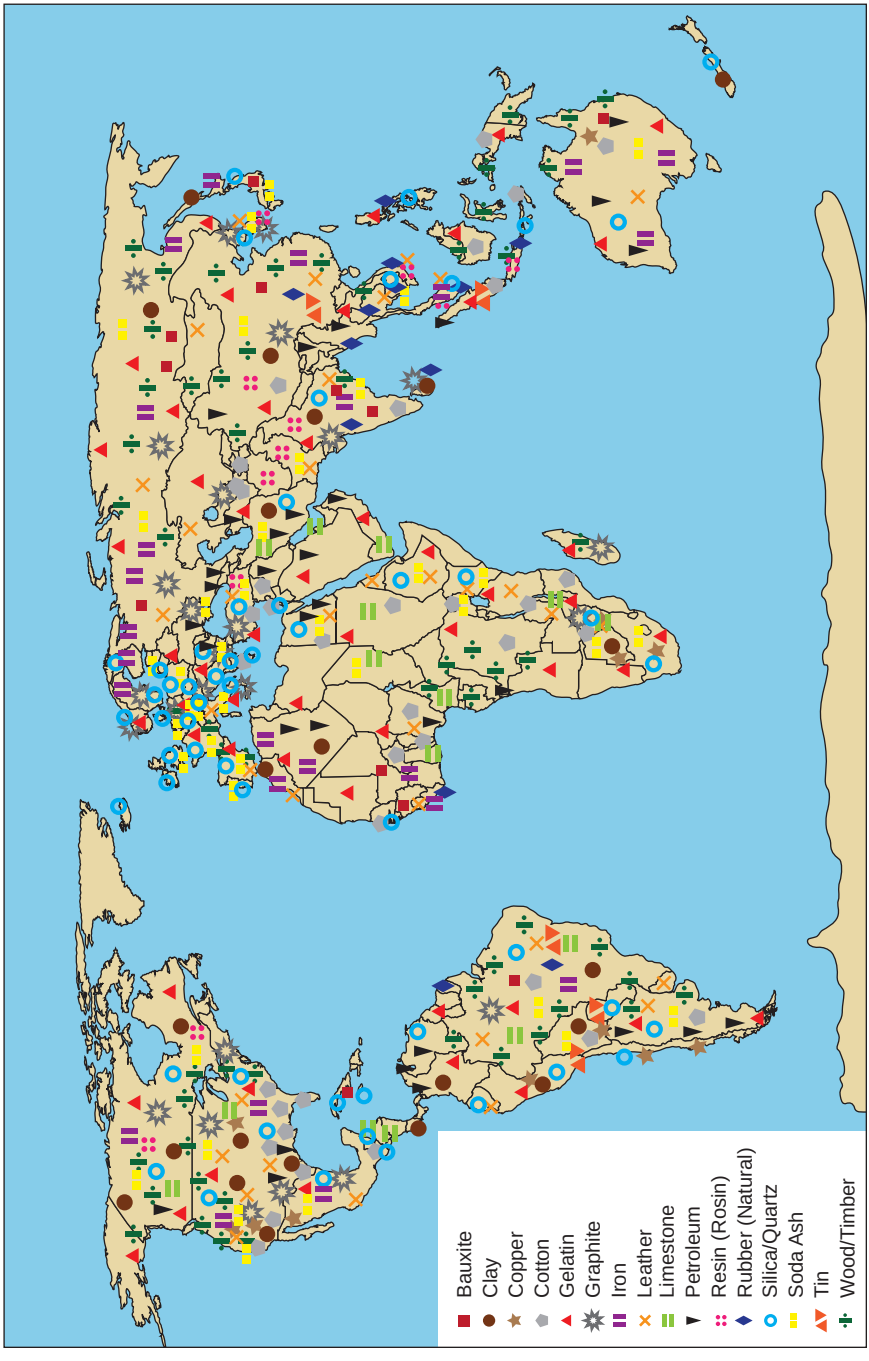
Toy Name: _____



Toy Design Blueprint



A World of Resources



Resource Transportation Chart

Raw Material Yielded	Source of Materials	Estimated Distance Transported (miles)
Bauxite	Brazil	6510 mi
Clay	California	100 mi
Copper	Arizona	700 mi
Cotton	Alabama	2125 mi
Gelatin	California	150 mi
Graphite	Arizona	700 mi
Iron	Minnesota	1560 mi
Leather	Texas	1540 mi
Limestone	California	200 mi
Petroleum	Texas	1700 mi
Resin (rosin)	China	6500 mi
Rubber (natural)	Venezuela	4306 mi
Silica/Quartz	California	150 mi
Soda ash	Montana	912 mi
Tin	New Mexico	1000 mi
Wood/timber	California	300 mi

World Travelers

Step 1: Write the names of three resources you need to make your toy on the lines labelled Natural Resource #1, Natural Resource #2, and Natural Resource #3.

Step 2: Look at the chart on page 11 (A World of Resources). Find your resources on the chart and write the estimated distance on the line labelled Distance transported.

Step 3: Circle your choices of how you will transport each resource to California.

Step 4: Add all the distances for a total estimate of how far the resources travel.

Name of natural resource #1: _____

Distance transported (estimate in miles) = _____

Type of Transportation Needed (circle one):

Truck Train Aircraft Ship

Name of natural resource #2: _____

Distance transported (estimate in miles) = _____

Type of Transportation Needed (circle one):

Truck Train Aircraft Ship

Name of natural resource #3: _____

Distance transported (estimate in miles) = _____

Type of Transportation Needed (circle one):

Truck Train Aircraft Ship

Total estimated distance all cargo will travel: _____ **miles**

Meet the Extractors and Harvesters

As you learn about these extractors and harvesters, answer the following questions:

Copper Extractor (Miner)

1. How do you do your job? What types of machines, materials, and energy do you use?

2. What is the raw material that you extract?

3. Is the raw material processed before it can be used? How?

Meet the Extractors and Harvesters

Cotton Harvester (Farmer)

1. How do you do your job? What types of machines, materials, and energy do you use?

2. What is the raw material that you harvest?

3. Is the raw material processed before it can be used? How?

Meet the Extractors and Harvesters

Petroleum Extractor

1. How do you do your job? What types of machines, materials, and energy do you use?

2. What is the raw material that you extract?

3. Is the raw material processed before it can be used? How?

Meet the Extractors and Harvesters

Silica Extractor (Miner)

1. How do you do your job? What types of machines, materials, and energy do you use?

2. What is the raw material that you extract?

3. Is the raw material processed before it can be used? How?

Meet the Extractors and Harvesters

Wood Harvester (Logger)

1. How do you do your job? What types of machines, materials, and energy do you use?

2. What is the raw material that you extract?

3. Is the raw material processed before it can be used? How?

To Extract or to Harvest: That Is the Question!

Today's Task

Look at the design blueprint of your toy on pages 8–9 and identify one natural resource that you will use in making your toy.

Fill in the information below about the extraction or harvesting method used to obtain that resource. Use what you wrote on pages 13–17 to help you.

Natural resource needed:

_____

Method of getting the resource: (circle one)

Extraction or Harvesting

Describe how this resource is extracted or harvested:

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

The Toy's Effects

Today's Task

Answer the following questions about how the creation of your toy could affect natural systems. Include at least **two examples** in each of your answers.

1. How can **extracting** or **harvesting** the resources used in your toy affect ecosystems?

2. How can **transporting** the resources to the factory that makes your toy affect ecosystems?

The Toy's Effects

3. How can **making** your toy in a factory affect ecosystems?

4. How can **transporting** the finished toy to stores affect ecosystems?

5. Can your toy affect ecosystems after it is used? How?

Inputs and Outputs

Today's Task

Draw an input-output diagram like the one you just did with your class. You can use any of the pages in the journal to help you.

Think about:

Inputs

- natural resources
- raw materials
- energy
- money

Outputs

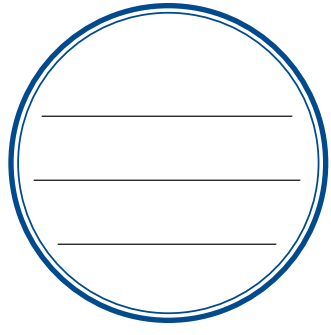
- changes to water, land, plants, or animals
- leftover materials, emissions

Write the name of your toy in the circle on the next page.

For each **input** you can think of for your toy, draw an arrow pointing *toward* the circle. On the arrow, write what the input is. Show as many inputs as you can.

Draw arrows pointing *away* from the circle for each **output** you can think of. On each arrow, write what the output is. Show as many outputs as you can.

Inputs and Outputs



Unit Title: **Made from Earth: How Natural Resources Become Things We Use**
Grade: **6**
Discipline: **Science**
Standard Number: **6.6.c.**

California Education and the Environment Initiative